



SEQUENCE LISTING

<110> Degussa AG
May, Oliver
Drauz, Karlheinz
Buchholz, Stefan

<120> Screening Process for Hydantoin Racemases

<130> 7601/84454

<140> 10/559,434
<141> 2005-12-05

<150> PCT/EP2004/005239
<151> 2004-05-15

<160> 16

<170> PatentIn version 3.3

<210> 1
<211> 6
<212> PRT
<213> Artificial sequence

<220>
<223> consensus sequence found in hydantoin racemase sequence of
Arthrobacter crystallopioetes

<220>
<221> misc_feature
<222> (2)..(2)
<223> Xaa is an amino acid selected from A, R, N, D, C, Q, E, H, I, L,
K, M, F, P, S, T, Y or V

<220>
<221> misc_feature
<222> (4)..(4)
<223> Xaa is an amino acid selected from P and T

<400> 1

Phe Xaa Asp Xaa Gly Leu
1 5

<210> 2
<211> 236
<212> PRT
<213> Arthrobacter crystallopioetes

<400> 2

Met Arg Ile Leu Val Ile Asn Pro Asn Ser Ser Ser Ala Leu Thr Glu
1 5 10 15

Ser Val Ala Asp Ala Ala Gln Gln Val Val Ala Thr Gly Thr Ile Ile
20 25 30

Ser Ala Ile Asn Pro Ser Arg Gly Pro Ala Val Ile Glu Gly Ser Phe
 35 40 45

Asp Glu Ala Leu Ala Thr Phe His Leu Ile Glu Glu Val Glu Arg Ala
 50 55 60

Glu Arg Glu Asn Pro Pro Asp Ala Tyr Val Ile Ala Cys Phe Gly Asp
 65 70 75 80

Pro Gly Leu Asp Ala Val Lys Glu Leu Thr Asp Arg Pro Val Val Gly
 85 90 95

Val Ala Glu Ala Ala Ile His Met Ser Ser Phe Val Ala Ala Thr Phe
 100 105 110

Ser Ile Val Ser Ile Leu Pro Arg Val Arg Lys His Leu His Glu Leu
 115 120 125

Val Arg Gln Ala Gly Ala Thr Asn Arg Leu Ala Ser Ile Lys Leu Pro
 130 135 140

Asn Leu Gly Val Met Ala Phe His Glu Asp Glu His Ala Ala Leu Glu
 145 150 155 160

Thr Leu Lys Gln Ala Ala Lys Glu Ala Val Gln Glu Asp Gly Ala Glu
 165 170 175

Ser Ile Val Leu Gly Cys Ala Gly Met Val Gly Phe Ala Arg Gln Leu
 180 185 190

Ser Asp Glu Leu Gly Val Pro Val Ile Asp Pro Val Glu Ala Ala Cys
 195 200 205

Arg Val Ala Glu Ser Leu Val Ala Leu Gly Tyr Gln Thr Ser Lys Ala
 210 215 220

Asn Ser Tyr Gln Lys Pro Thr Glu Lys Gln Tyr Leu
 225 230 235

<210> 3

<211> 711

<212> DNA

<213> Artificial sequence

<220>

<223> mutated hydantoin racemase sequence of Arthrobacter
 crystallopioetes

<400> 3		
atgagaatcc tcgtgatcaa ccccaacagt tccagcgccc ttactgaatc ggttgcggac	60	
gcagcacaac aagtgtcgc gaccggcacc ataatttctg ccatcaaccc ctccagagga	120	
cccgccgtca ttgaaggcag ctttgacgaa gcactggcca cgttccatct cattgaagag	180	
gtggagcgcg ctgagcggga aaacccgccc gacgcctacg tcatgcatg tttcagggat	240	
ccgggacttg acgcgtcaa ggagctgact gacaggccag tggtaggagt tgccgaagct	300	
gcaatccaca tgttttcatt cgtcgccggcc accttctcca ttgtcagcat cctccccagg	360	
gtcaggaaac atctgcacga actggtaacgg caagcggggg cgacgaatcg cctcgccctcc	420	
atcaagctcc caaatctggg ggtgatggcc ttccatgagg acgaacatgc cgcaactggag	480	
acgctcaaac aagccgccaa ggaggcggtc caggaggacg ggcggcagtc gatagtgctc	540	
ggatgcgccc gcatggtggg gtttgcgcgt caactgagcg acgaactcgg cgtccctgtc	600	
atcgaccccg tcgagggcagc ttgccgcgtg gccgagagtt tggtcgtctt gggctaccag	660	
accagcaaag cgaactcgta tcaaaaaccg acagagaagc agtacctcta g	711	

<210> 4

<211> 236

<212> PRT

<213> Artificial sequence

<220>

<223> mutated hydantoin racemase sequence of Arthrobacter
crystallopoietes

<400> 4

Met Arg Ile Leu Val Ile Asn Pro Asn Ser Ser Ser Ala Leu Thr Glu			
1	5	10	15

Ser Val Ala Asp Ala Ala Gln Gln Val Val Ala Thr Gly Thr Ile Ile		
20	25	30

Ser Ala Ile Asn Pro Ser Arg Gly Pro Ala Val Ile Glu Gly Ser Phe		
35	40	45

Asp Glu Ala Leu Ala Thr Phe His Leu Ile Glu Glu Val Glu Arg Ala		
50	55	60

Glu Arg Glu Asn Pro Pro Asp Ala Tyr Val Ile Ala Cys Phe Arg Asp			
65	70	75	80

Pro Gly Leu Asp Ala Val Lys Glu Leu Thr Asp Arg Pro Val Val Gly		
85	90	95

Val Ala Glu Ala Ala Ile His Met Ser Ser Phe Val Ala Ala Thr Phe
 100 105 110

Ser Ile Val Ser Ile Leu Pro Arg Val Arg Lys His Leu His Glu Leu
 115 120 125

Val Arg Gln Ala Gly Ala Thr Asn Arg Leu Ala Ser Ile Lys Leu Pro
 130 135 140

Asn Leu Gly Val Met Ala Phe His Glu Asp Glu His Ala Ala Leu Glu
 145 150 155 160

Thr Leu Lys Gln Ala Ala Lys Glu Ala Val Gln Glu Asp Gly Ala Glu
 165 170 175

Ser Ile Val Leu Gly Cys Ala Gly Met Val Gly Phe Ala Arg Gln Leu
 180 185 190

Ser Asp Glu Leu Gly Val Pro Val Ile Asp Pro Val Glu Ala Ala Cys
 195 200 205

Arg Val Ala Glu Ser Leu Val Ala Leu Gly Tyr Gln Thr Ser Lys Ala
 210 215 220

Asn Ser Tyr Gln Lys Pro Thr Glu Lys Gln Tyr Leu
 225 230 235

<210> 5

<211> 711

<212> DNA

<213> Artificial sequence

<220>

<223> mutated hydantoin racemase sequence of Arthrobacter
 crystallopoietes

<400> 5

atgagaatcc tcgtgatcaa ccccaacagt tccagcgccc ttactgaatc gtttgcggac 60

gcagcacaaac aagttgtcgc gaccggcacc ataatttctg ccatcaaccc ctccagagga 120

cccgccgtca ttgaaggcag ctttgacgaa gcactggcca cgttccatct cattgaagag 180

gtggagcgcg ctgagcggga aaacccgccc gacgcctacg tcatgcatg tttcgaggat 240

ccgggacttg acgcgtcaa ggagctgact gacaggccag tggttaggagt tgccgaagct 300

gcaatccaca tgtcttcatt cgtcgcccc accttctcca ttgtcagcat cctcccgagg 360

gtcaggaaac atctgcacga actggtaacgg caagcggggg cgacgaatcg cctcgctcc 420

atcaagctcc caaatctggg ggtgatggcc ttccatgagg acgaacatgc cgcaactggag 480

acgctcaaac aagccgccaa ggaggcggtc caggaggacg gcccgcagtc gatagtgc
 540
 ggtatgcgccc gcatggtggg gtttgcgcgt caactgagcg acgaactcg
 600
 atcgaccggc tcgaggcagc ttgccgcgtg gccgagagtt tggtcgtct gggctaccag
 660
 accagcaaag cgaactcgta tcaaaaaccg acagagaagc agtacctcta g
 711

<210> 6

<211> 236

<212> PRT

<213> Artificial sequence

<220>

<223> mutated hydantoin racemase sequence of Arthrobacter
 crystallopoietes

<400> 6

Met	Arg	Ile	Leu	Val	Ile	Asn	Pro	Asn	Ser	Ser	Ser	Ala	Leu	Thr	Glu
1															15

Ser	Val	Ala	Asp	Ala	Ala	Gln	Gln	Val	Val	Ala	Thr	Gly	Thr	Ile	Ile
														20	30

Ser	Ala	Ile	Asn	Pro	Ser	Arg	Gly	Pro	Ala	Val	Ile	Glu	Gly	Ser	Phe
														35	45

Asp	Glu	Ala	Leu	Ala	Thr	Phe	His	Leu	Ile	Glu	Glu	Val	Glu	Arg	Ala
														50	60

Glu	Arg	Glu	Asn	Pro	Pro	Asp	Ala	Tyr	Val	Ile	Ala	Cys	Phe	Glu	Asp
														65	80

Pro	Gly	Leu	Asp	Ala	Val	Lys	Glu	Leu	Thr	Asp	Arg	Pro	Val	Val	Gly
														85	95

Val	Ala	Glu	Ala	Ala	Ile	His	Met	Ser	Ser	Phe	Val	Ala	Ala	Thr	Phe
														100	110

Ser	Ile	Val	Ser	Ile	Leu	Pro	Arg	Val	Arg	Lys	His	Leu	His	Glu	Leu
														115	125

Val	Arg	Gln	Ala	Gly	Ala	Thr	Asn	Arg	Leu	Ala	Ser	Ile	Lys	Leu	Pro
														130	140

Asn	Leu	Gly	Val	Met	Ala	Phe	His	Glu	Asp	Glu	His	Ala	Ala	Leu	Glu
														145	150

155

160

Thr Leu Lys Gln Ala Ala Lys Glu Ala Val Gln Glu Asp Gly Ala Glu
 165 170 175

Ser Ile Val Leu Gly Cys Ala Gly Met Val Gly Phe Ala Arg Gln Leu
 180 185 190

Ser Asp Glu Leu Gly Val Pro Val Ile Asp Pro Val Glu Ala Ala Cys
 195 200 205

Arg Val Ala Glu Ser Leu Val Ala Leu Gly Tyr Gln Thr Ser Lys Ala
 210 215 220

Asn Ser Tyr Gln Lys Pro Thr Glu Lys Gln Tyr Leu
 225 230 235

<210> 7
 <211> 711
 <212> DNA
 <213> Artificial sequence

<220>
 <223> mutated hydantoin racemase sequence of Arthrobacter
 crystallopioetes

<400> 7
 atgagaatcc tcgtgatcaa ccccaacagt tccagcgccc ttactgaatc gtttgcggac 60
 gcagcacaac aagttgtcgc gaccggcacc ataatttctg ccatcaaccc ctccagagga 120
 cccggcgtca ttgaaggcag ctttgacgaa gcactggcca cgttccatct cattgaagag 180
 gtggagcgcg ctgagcggga aaacccgccc gacgcctacg tcatcgcatg tttccagtag 240
 ccgggacttg acgcggtaa ggagctgact gacaggccag tggttaggagt tgccgaagct 300
 gcaatccaca tgttttcatt cgtcgggcc accttctcca ttgtcagcat cctcccgagg 360
 gtcaggaaac atctgcacga actgg tacgg caagcggggg cgacgaatcg cctcgctcc 420
 atcaagctcc caaatctggg ggtgatggcc ttccatgagg acgaacatgc cgcactggag 480
 acgctcaaac aagccgccaa ggaggcggc caggaggacg ggcggagtc gatagtgc 540
 ggtatgcgcg gcatggtggg gtttgcgcgt caactgagcg acgaactcgg cgtccctgtc 600
 atcgaccccg tcgaggcagc ttgcccgcgtg gccgagagtt tggtcgctct gggctaccag 660
 accagcaaag cgaactcgta tcaaaaacctg acagagaagc agtacctcta g 711

<210> 8
 <211> 236
 <212> PRT
 <213> Artificial sequence

<220>

<223> mutated hydantoin racemase sequence of Arthrobacter
crystallopioetes

<400> 8

Met Arg Ile Leu Val Ile Asn Pro Asn Ser Ser Ser Ala Leu Thr Glu
1 5 10 15

Ser Val Ala Asp Ala Ala Gln Gln Val Val Ala Thr Gly Thr Ile Ile
20 25 30

Ser Ala Ile Asn Pro Ser Arg Gly Pro Ala Val Ile Glu Gly Ser Phe
35 40 45

Asp Glu Ala Leu Ala Thr Phe His Leu Ile Glu Glu Val Glu Arg Ala
50 55 60

Glu Arg Glu Asn Pro Pro Asp Ala Tyr Val Ile Ala Cys Phe Gln Asp
65 70 75 80

Pro Gly Leu Asp Ala Val Lys Glu Leu Thr Asp Arg Pro Val Val Gly
85 90 95

Val Ala Glu Ala Ala Ile His Met Ser Ser Phe Val Ala Ala Thr Phe
100 105 110

Ser Ile Val Ser Ile Leu Pro Arg Val Arg Lys His Leu His Glu Leu
115 120 125

Val Arg Gln Ala Gly Ala Thr Asn Arg Leu Ala Ser Ile Lys Leu Pro
130 135 140

Asn Leu Gly Val Met Ala Phe His Glu Asp Glu His Ala Ala Leu Glu
145 150 155 160

Thr Leu Lys Gln Ala Ala Lys Glu Ala Val Gln Glu Asp Gly Ala Glu
165 170 175

Ser Ile Val Leu Gly Cys Ala Gly Met Val Gly Phe Ala Arg Gln Leu
180 185 190

Ser Asp Glu Leu Gly Val Pro Val Ile Asp Pro Val Glu Ala Ala Cys
195 200 205

Arg Val Ala Glu Ser Leu Val Ala Leu Gly Tyr Gln Thr Ser Lys Ala
210 215 220

Asn Ser Tyr Gln Lys Pro Thr Glu Lys Gln Tyr Leu
 225 230 235

<210> 9
 <211> 711
 <212> DNA
 <213> Artificial sequence

<220>
 <223> mutated hydantoin racemase sequence of Arthrobacter
 crystallopoietes

<400> 9
 atgagaatcc tcgtgatcaa ccccaacagt tccagcgccc ttactgaatc gtttgcggac 60
 gcagcacaac aagttgtcgc gaccggcacc ataatttctg ccatcaaccc ctccagagga 120
 cccgccccgtca ttgaaggcag ctttgacgaa gcactggcca cgttccatct cattgaagag 180
 gtggagcgcg ctgagcggga aaacccgccc gacgcctacg tcatcgcatg tttcttggat 240
 ccgggacttg acgcggtaa ggagctgact gacaggccag tggttaggagt tgccgaagct 300
 gcaatccaca tgtcttcatt cgtcgcggcc accttctcca ttgtcagcat cctcccgagg 360
 gtcagggaaac atctgcacga actgg tacgg caagcggggg cgacgaatcg cctcgccctcc 420
 atcaagctcc caaatctggg ggtgatggcc ttccatgagg acgaacatgc cgcactggag 480
 acgctcaaac aagccgccaa ggaggcggtc caggaggacg ggcgcgagtc gatagtgctc 540
 ggatgcgcgg gcatgggtgg gtttgcgcgt caactgagcg acgaactcgg cgtccctgtc 600
 atcgaccccg tcgaggcagc ttgccgcgtg gccgagagtt tggtcgctct gggctaccag 660
 accagcaaag cgaactcgta tcaaaaaccg acagagaagc agtacctcta g 711

<210> 10
 <211> 236
 <212> PRT
 <213> Artificial sequence

<220>
 <223> mutated hydantoin racemase sequence of Arthrobacter
 crystallopoietes

<400> 10

Met Arg Ile Leu Val Ile Asn Pro Asn Ser Ser Ser Ala Leu Thr Glu
 1 5 10 15

Ser Val Ala Asp Ala Ala Gln Gln Val Val Ala Thr Gly Thr Ile Ile
 20 25 30

Ser Ala Ile Asn Pro Ser Arg Gly Pro Ala Val Ile Glu Gly Ser Phe
 35 40 45

Asp Glu Ala Leu Ala Thr Phe His Leu Ile Glu Glu Val Glu Arg Ala
 50 55 60

Glu Arg Glu Asn Pro Pro Asp Ala Tyr Val Ile Ala Cys Phe Leu Asp
 65 70 75 80

Pro Gly Leu Asp Ala Val Lys Glu Leu Thr Asp Arg Pro Val Val Gly
 85 90 95

Val Ala Glu Ala Ala Ile His Met Ser Ser Phe Val Ala Ala Thr Phe
 100 105 110

Ser Ile Val Ser Ile Leu Pro Arg Val Arg Lys His Leu His Glu Leu
 115 120 125

Val Arg Gln Ala Gly Ala Thr Asn Arg Leu Ala Ser Ile Lys Leu Pro
 130 135 140

Asn Leu Gly Val Met Ala Phe His Glu Asp Glu His Ala Ala Leu Glu
 145 150 155 160

Thr Leu Lys Gln Ala Ala Lys Glu Ala Val Gln Glu Asp Gly Ala Glu
 165 170 175

Ser Ile Val Leu Gly Cys Ala Gly Met Val Gly Phe Ala Arg Gln Leu
 180 185 190

Ser Asp Glu Leu Gly Val Pro Val Ile Asp Pro Val Glu Ala Ala Cys
 195 200 205

Arg Val Ala Glu Ser Leu Val Ala Leu Gly Tyr Gln Thr Ser Lys Ala
 210 215 220

Asn Ser Tyr Gln Lys Pro Thr Glu Lys Gln Tyr Leu
 225 230 235

<210> 11
<211> 25
<212> DNA
<213> Artificial sequence

<220>
<223> PCR plasmid for ampifying plasmids containg a sequence encoding
hydantoin racemase of Arthrobacter crystallopietes

<400> 11
ggcgcaagga atggtgcatg catcg 25

<210> 12
 <211> 30
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> PCR plasmid for ampifying plasmids containg a sequence encoding
 hydantoin racemase of Arthrobacter crystallopioetes

 <400> 12
 ggtcaggtgg gtccaccgcg ctactgccgc 30

<210> 13
 <211> 5777
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> plasmid containing sequence encoding hydantoin racemase of
 Arthrobacter crystallopioetes

 <400> 13
 aattcttaag aaggagatat acatatgaga atcctcgtga tcaaccccaa cagttccagc 60
 gcccttactg aatcggttgc ggacgcagca caacaagttg tcgcgaccgg caccataatt 120
 tctgccatca acccctccag aggacccgccc gtcattgaag gcagcttga cgaagcactg 180
 gccacgttcc atctcattga agaggtggag cgcgctgagc gggaaaaccc gcccgacgcc 240
 tacgtcatcg catgtttcgg ggatccggga cttgacgcgg tcaaggagct gactgacagg 300
 ccagtggtag gagttgccga agctgcaatc cacatgtctt cattcgctgc ggccaccttc 360
 tccattgtca gcattctccc gagggtcagg aaacatctgc acgaactggt acggcaagcg 420
 ggggcacga atcgccctcgc ctccatcaag ctcccaaatac tgggggtgat ggccattccat 480
 gaggacgaac atgccgcact ggagacgctc aaacaagccg ccaaggaggc ggtccaggag 540
 gacggcgccg agtcgatagt gctcgatgc gccggcatgg tggggtttgc gcgtcaactg 600
 agcgacgaac tcggcgtccc tgtcatcgac cccgtcgagg cagcttgcgg cgtggccgag 660
 agtttggtcg ctctggctta ccagaccagc aaagcgaact cgtatcaaaa accgacagag 720
 aaggcgttacc tctagctgca gccaagcttc tggtttggcg gatgagagaa gatttcagc 780
 ctgatacaga tttaaatcaga acgcagaagc ggtctgataa aacagaattt gcctggcgcc 840
 agtagcgcgg tggtcccacc tgacccatg ccgaactcag aagtgaaacg ccgtacgcgc 900
 gatggtagtg tggggcttcc ccatgcgaga gtaggaaact gccaggcatc aaataaaaacg 960
 aaaggctcag tcgaaagact gggcattcg ttttatctgt tggttgcgg tgaacgctct 1020
 cctgatagg acaaattccgc cgggagcggta tttaaacgtt gcaagcaac ggcccgagg 1080
 gtggcgggca ggacgccccgc cataaactgc caggcatcaa attaaggcaga aggccatcct 1140

gacggatggc	cttttgcgt	ttctacaaac	tctttgtt	attttctaa	atacattcaa	1200
atatgtatcc	gctcatgaga	caataaccct	gataaatgct	tcaataatat	cgtccattcc	1260
gacagcatcg	ccagtcacta	tggcgtgctg	ctagcgctat	atgcgttgat	gcaatttcta	1320
tgcgcacccg	ttctcggagc	actgtccgac	cgcttggcc	gccgcccagt	cctgctcgct	1380
tcgctacttg	gagccactat	cgactacgct	atcatggcga	ccacacccgt	cctgtggatc	1440
ctctacgccc	gacgcacgt	ggccggcattc	accggcgcca	caggtgcggt	tgctggcgcc	1500
tatatcgccg	acatcaccga	tgggaaagat	cgggctcgcc	acttcggct	catgagcgct	1560
tgtttcggcg	tggtatggt	ggcaggcccc	gtggccgggg	gactgttggg	cgcacatctcc	1620
ttgcatgcac	cattcattgc	ggcggcggtg	ctcaacggcc	tcaacactact	actgggctgc	1680
ttcctaattgc	aggagtcgca	taagggagag	cgtcgaccga	tgccctttag	agccttcaac	1740
ccagtcagct	cattccggtg	ggcgccccgc	atgactatcg	tcgcccact	tatgactgtc	1800
ttctttatca	tgcaactcg	aggacaggtg	ccggcagcgc	tctggtcat	tttcggcgag	1860
gaccgctttc	gctggagcgc	gacgatgatc	ggcctgtcgc	ttgcggatt	cggatcttg	1920
cacggccctcg	ctcaaggcatt	cgtcacttgt	cccgccacca	aacgttccgg	cgagaagcag	1980
gccattatcg	ccggcatggc	ggccgacgcg	ctgggctacg	tcttgcggc	gttcgcgacg	2040
cgaggctgga	tggcattccc	cattatgatt	cttctcgctt	ccggcggcat	cgggatgccc	2100
gcgttgcagg	ccatgctgtc	caggcaggta	gatgacgacc	atcagggaca	gttcaagga	2160
tcgctcgccg	ctcttaccag	cctaacttcg	atcactggac	cgctgatcg	cacggcgatt	2220
tatggcgct	cggcgagcac	atggaacggg	ttggcatgga	ttgttaggcgc	cgcctataac	2280
cttgtctgcc	tcccccggtt	gcgtcgcgg	gcatggagcc	gggccacctc	gacctgaatg	2340
gaaggccggcg	gcaccccgct	aacggattca	ccactccaag	aattggagcc	aatcaattct	2400
tgccggagaac	tgtgaatgcg	caaaccaacc	cttggcagaa	catatccatc	gcgtccgcca	2460
tctccagcag	ccgcacgcgg	cgcatctcg	gcagcgttgg	gtcctggcca	cgggtgcgc	2520
tgatcgtgct	cctgtcggtt	aggacccggc	taggctggcg	gggttgcctt	actggtagc	2580
agaatgaatc	accgatacgc	gagcgaacgt	gaagcgactg	ctgctgaaa	acgtctgcga	2640
cctgagcaac	aacatgaatg	gtcttcggtt	tccgttttc	gtaaagtctg	gaaacgcgga	2700
agtcccctac	gtgctgctga	agttggccgc	aacagagagt	ggaaccaacc	ggtgatacca	2760
cgataactatg	actgagagtc	aacgcccattga	gcggcctcat	ttcttattct	gagttacaac	2820
agtccgcacc	gctgtccgg	agtccttcc	ggtggcgcg	ggcattact	atcgctgcgc	2880
cacttatgac	tgtcttcttt	atcatgcaac	tcgttaggaca	ggtgccggca	gcccacaa	2940
gtccccccggc	cacggggcct	gccaccatac	ccacgcccga	acaagcgccc	tgcaccattta	3000

tgtccggat ctgcacgcga ggatgctgct ggctaccctg tggAACACCT acatctgtat	3060
taacgaagcg ctaaccgttt ttatcaggct ctgggaggca gaataaatga tcataatcg	3120
aattattacc tccacgggga gagcctgagc aaactggcct caggcattt agaAGCACAC	3180
ggtcacactg cttccggtag tcaataaacc ggtAAACCAG caatAGACAT aAGCggctat	3240
ttaacgaccc tgccctgaac cgacgaccgg gtGGAATTG cttcgaatt tctGCCATTc	3300
atccgcttat tatcacttat tcaggcgtag caccaggcgt ttaAGGGCAC caataACTGC	3360
cttaaaaaaaa ttacgccccg ccctgccact catgcagta ctGTTGTAAT tcattaAGCA	3420
ttctGCCGAC atgGAAGCCA tcacAGACGG catGATGAAC ctGAATGCC AGCGGcatca	3480
gcacCTTGTc gccttgcgta taatatttgc ccatGGTgaa AACGGGGCG aagaAGTTGT	3540
ccatattggc cacGTTaaa tcaAAACTGG tGAAACTCAC ccaggGATTG gctgagacga	3600
aaaACATATT ctcaataaac cctttAGGGA aatAGGCCAG gtttCACCg taACACGCCA	3660
catCTTGCgA atatatgtgt agAAACTGCC gGAAATCGTC gtGGTATTCA ctCCAGAGCG	3720
atgAAAACGT ttcaGTTGc tcatGGAAAA CGGTGTAACA AGGGTGAAACA ctATCCCATA	3780
tcaccAGCTC accgtCTTc attGCCatac gaattCCGGA tgAGCATTCA tcaggCgggc	3840
aagaATGTGA atAAAGGCCG gataAAACTT gtGCTTATTt ttcttacgg tctttaaaaa	3900
ggccGTAATA tccAGCTGAA CGGTCTGGTT atAGGTACAT tgAGCAACTG ACTGAAATGC	3960
ctcaAAATGT tctttacgat gCcattGGGA tataTCACG gtGGTATATC cAGTATTt	4020
tttCTCCATT ttagCTTcCT tagCTCCTGA AAATCTCGAT AACTCAAAAA ATACGCCCGG	4080
tagtgatCtt atttCATTat ggtGAAAGTT ggaACCTCtt acgtGCCGAT caACGTCTCA	4140
ttttCGCCAA aagtGGCCC agggCTTccc ggtatcaaca gggACACCAG gatttattta	4200
ttctGCGAAG tgatCTTCCG tcACAGGTAT ttattCGGCG caaAGTGCgt CGGGTGTG	4260
tgccaACTTA ctGATTTAGT gtATGATGgt gttttGAGG tgctCCAGTg gcttCTGTT	4320
ctatCAGCTG tCCCTCCTGT tcAGCTACTG acggGGTGGT GCGTAACGGC AAAAGCACCG	4380
ccggACATCA GCGCTAGCGG agtGtataCT ggCttACTAT gttGGCActG atGAGGGTGT	4440
cAGTGAAGTG CTTCATGTGG cAGGAGAAAA aaggCtGACc CGGTGCGTCA GcAGAAATATG	4500
tgataCAGGA tatattCCGc ttCCCTCGTC actGACTCGC tacGCTCGGT CGTTGACTG	4560
cgGCGAGCGG aaatGGCTTA cgaACGGGGC ggAGATTCC tggAAAGATGC cAGGAAGATA	4620
cttaACAGGG aagtGAGAGG gCCGCGGCAA agCCGTTTT ccatAGGCTC CGCCCCCCTG	4680
acaAGCATCA cGAAATCTGA CGCTCAAATC agtGGTGGCG aaACCCGACA GGACTATAAA	4740
gataACCAGGC gtttCCCTG GCGGCTCCCT CGTGCgtCT cctGTTCCtG ctttCGGTT	4800
taccGGTGTc attCCGCTGT tatGGCCGCG tttGtCTCAT tccACGCCtG acactCAGTt	4860

ccgggttaggc agttcgctcc aagctggact gtagtcacga accccccgtt cagtcgcacc	4920
gctgcgcctt atccggtaac tatcgtcttg agtccaaccc ggaaagacat gcaaaagcac	4980
cactggcagc agccactggt aattgattta gaggagttag tcttgaagtc atgcgccggt	5040
taaggctaaa ctgaaaggac aagtttttgtt gactgcgctc ctccaagcca gttacctcg	5100
ttcaaagagt tggtagctca gagaaccttc gaaaaaccgc cctgcaaggc ggtttttcg	5160
tttcagagc aagagattac gcgcagacca aaacgatctc aagaagatca tcttattaaat	5220
cagataaaat attcaagat ttcatgtcaa tttatctttt caaatgtagc acctgaagtc	5280
agccccatac gatataagtt gtaattctca tgtttgacag cttatcatcg ataagctta	5340
atgcggtagt ttatcacagt taaattgcta acgcagtcag gcaccgtgt tgaaatctaa	5400
caatgcgctc atcgtcatcc tcggcaccgt caccctggat gctgtaggca taggcttggt	5460
tatgccggta ctgccggcc tcttgcggga ttagtcatgc cccgcgccca ccggaaggag	5520
ctgactgggt tgaaggctct caagggcatc ggtcgacgct ctcccttatg cgactcctgc	5580
attaggaagc agcccagtag taggttgagg ccgttgagca ccgcccgc aaggaatgg	5640
gcatgcacatcg atcaccacaa ttcatgtcaa tgtgaacatc atcacgttca tctttccctg	5700
gttgccaaatg gcccattttc ctgtcagtaa cgagaaggtc gcgaattcag ggcgttttta	5760
gactggtcgt aatgaac	5777

<210> 14
 <211> 7175
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> plasmid containing sequence encoding hydantoin racemase of
 Arthrobacter crystallopoietes

<220>	
<221> misc_feature	
<222> (49)..(49)	
<223> n is a, c, g, or t	
<400> 14	
aattcttaag aaggagatat acatatgacc ctgcagaaag cgcaagcgna ggcgcattgag	60
aaagagatct gggagctctc ccggttctcg gcggaaaggcc ccgggtttac ccggctgacc	120
tacactccag agcatgccgc cgccggaa acgctcattg cggctatgga agcggccgct	180
ttgagcgttc gtgaagacgc tctcggaaac atcatcgcc gacgtgaagg cactgatccg	240
cagctccctg cgatcgccgt cggttcacac ttgcattctg tccgaaacgg cggatgttc	300
gatggcactg caggcgtggt gtgcgcctt gaggctgcc gggatgtgc ggagagcggc	360

tacgtgaatc ggcattccatt tgagttcatc gcgatcggtgg aggaggaagg ggcccgcttc	420
agcagtggca tggggccatt gcaggttgg tcgcccacag gaaactggac	480
tctttgggttg atgaggatgg agtgtccgtt aggcaggcgg ctactgcctt cggcttgaag	540
ccgggcgaac tgcaggctgc agcccgtcc gcggcggacc tgcgtgttt tatcgaacta	600
cacattgaac aaggaccat cctcgagcag gagcaaata tag agatcgagt tgtgacctcc	660
atcggttggcg ttgcgcatt gcgggttgct gtcaaaggca gaagcgcaca cgccggcaca	720
acccccatgc acctgcgcca gnatgcgctg gtacccgcgg ctctcatggc gcgggaggc	780
aaccgggttcg tcaacgagat cgccgatggc acagtggcta ccgttggcca cttcacagt	840
gccccccggc gcgcaacca ggtcccgggg gaggtggagt tcacactgga cttgcgttct	900
ccgcatgagg agtcgctccg ggtgttgatc aaccgcattt cggcatggc cggcggaggc	960
gcctcgagg ccgggttggc tgccgatgtg gatgaatttt tcaatctcag cccgggtgcag	1020
ctggctccta ccatgggttggc cgccgttcgc gaagcggcct cggccctgca gttcacgcac	1080
cgggatatca gcagtggggc gggccacgac tcgatgttca tcgcccaggta cacggacgtc	1140
ggaatggttt tcgttccaag ccgtgctggc cggagccacg ttcccgaaga atggaccgat	1200
ttcgatgacc ttgcgaagg aactgagggtt gtcctccggg taatgaaggc acttgaccgg	1260
ggatcccattt atcatcatca tcattgactg cagccaaatct tctgtttgg cggatgagag	1320
aagattttca gcctgatata gattaaatca gaacgcagaa gcggtctgat aaaacagaat	1380
ttgcctggcg gcagtagcgc ggtggtccca cctgacccca tgccgaactc agaagtgaaa	1440
cgccgttagcg ccgatggtag tgggggtct cccatgcga gagtagggaa ctgccaggca	1500
tcaaataaaa cggaaaggctc agtcgaaaga ctgggcctt cgtttatct gttgtttgtc	1560
ggtgaacgct ctcctgagta ggacaaatcc gccgggagcgt gatttgaacg ttgcgaagca	1620
acggcccgga ggggtggcgcc caggacgccc gccataaaact gccaggcatc aaattaagca	1680
gaaggccatc ctgacggatg gccttttgc gtttctacaa actctttgt ttattttct	1740
aaatacatcc aaatatgtat ccgctcatga gacaataacc ctgataaaatg cttcaataat	1800
attaaaaaaag gaagagtatg agtattcaac atttccgtgt cggccatttatt cccttttttgc	1860
cgccatttttgc ctttcctgtt tttgctcacc cagaaacgct ggtgaaagta aaagatgctg	1920
aagatcagggtt ggggtgcacga gtgggttaca tcgaactggta tctcaacagc ggtaagatcc	1980
ttgagagttt tcgccccgaa gaacgttttc caatgatgag cactttaaa gttctgctat	2040
gtggcgcgtt attatccgt gttgacgccc ggcaagagca actcggcgtcgc cgcatacact	2100
attctcagaa tgacttgggtt gagtactcac cagtcacaga aaagcatctt acggatggca	2160
tgacagtaag agaattatgc agtgctgcca taaccatgag tgataaacact gcggccaact	2220

tacttctgac aacgatcgga ggaccgaagg agctaaccgc tttttgcac aacatgggg	2280
atcatgtAAC tcgccttgat cgTTgggaac cggagctgaa tgaAGCCATA ccaaACGACG	2340
agcgtgacac cacgatgcct gtagcaatgg caacaacgtt gcgcaaacta ttaactggcg	2400
aactacttac tctagcttcc cggaacaat taatagactg gatggaggcg gataaaagtgg	2460
caggaccact tctgcgctcg gcccttcgg ctggctggtt tattgctgat aaatctggag	2520
ccggtgagcg tgggtctcgc ggtatcattg cagcaCTGGG gCCAGATGGT aAGCCCTCCC	2580
gtatcgtagt tatctacacg acggggagtc aggcaactat ggatgaacga aatagacaga	2640
tcgctgagat aggtgcctca ctgattaAGC attggtaact gtcagaccaa gtttactcat	2700
atatacttta gattgattta aaacttcatt tttaatttaa aaggatctag gtgaagatcc	2760
ttttgataa tctcatgacc aaaatccctt aacgtgagtt ttcgttccac tgagcgtcag	2820
accccgtaga aaagatcaaa gnatcttctt gagatccttt tttctgcgc gtaatctgct	2880
gcttgcaaAC aaaaaaacca ccgctaccag cggTggTTG tttGCCGGat caagagctac	2940
caactctttt tccgaaggta actggcttca gcagagcgcA gataccaaat actgtccttc	3000
tagttagcc gtagttaggc caccacttca agaactctgt agcaccgcct acataccctcg	3060
ctctgctaAT cctgttacca gtggctgctg ccagtggcga taagtcgtgt cttaccgggt	3120
tggactcaag acgatAGTTA ccggataagg cgcagcggc gggctgaacg gggggttcgt	3180
gcacacagcc cagcttggag cgaacgcacct acaccgaact gagataccta cagcgtgagc	3240
tatgagaaaAG cgccacgctt cccgaaggGA gaaaggcggA caggtatccg gtaagcggca	3300
gggtcggAAC aggagagcgc acgagggagc ttccaggGGG aaacgcctgg tatctttata	3360
gtcctgtcgg gtttcGCCAc ctctgacttg agcgtcgatt tttgtgatgc tcgtcaggGG	3420
ggcggagcct atggaaaaAC gccagcaacg cggcTTTTT acggTcctg gcctttgct	3480
ggcctttgc tcacatgttc ttccctgcgt tatcccctga ttctgtggat aaccgtattA	3540
ccgccttga gtgagctgat accgctcgcc gcagccgaac gaccgagcgc agcgagtcaG	3600
tgagcgagGA agcggAAAGAG cgcctgatgc ggtatTTCT cttacgcAt ctgtcggta	3660
tttcacaccc catatatggT gcactctcag tacaatctgc tctgatGCCG catagttaAG	3720
ccagtataca ctccgctatc gctacgtgac tgggtcatgg ctgcggccccG acacccgcca	3780
acacccgctg acgcggccctg acgggcttgt ctgctccgg catccgctta cagacaagct	3840
gtgaccgtct cggggagctg catgtgtcag aggtttcac cgtcatcacc gaaacgcgcg	3900
aggcagctgc ggtAAAGCTC atcagcgtgg tcgtgaagcg attcacagat gtctgcctgt	3960
tcatccgcgt ccagctcgTT gagTTCTCC agaagcgtta atgtctggct tctgataaaAG	4020
cgggccatgt taagggcggt ttttccgtt ttggtaactt gatgcctccg tgtaaggggg	4080

aatttctgtt	catggggta	atgataccga	tgaaacgaga	gaggatgctc	acgatacggg	4140
ttactgtga	tgaacatgcc	cggttactgg	aacgttgtga	ggtaaacaa	ctggcggtat	4200
ggatgcggcg	ggaccagaga	aaaatcactc	aggtaatg	ccagcgcttc	gttaatacag	4260
atgttaggtt	tccacagggt	agccagcagc	atcctgcgt	gcagatccgg	aacataatgg	4320
tgcagggcgc	tgacttccgc	gttccagac	tttacgaaac	acggaaaccg	aagaccattc	4380
atgttgtgc	tcaggtcgca	gacgtttgc	agcagcagtc	gcttcacgtt	cgctcgctga	4440
tcgggtattc	attctgctaa	ccagtaaggc	aaccccgc	gcctagccgg	gtcctaaccg	4500
acaggagcac	gatcatgcgc	acccgtggcc	aggacccaac	gctgcccag	atgcgcccgcg	4560
tgcggctgct	ggagatggcg	gacgcgttgg	atatgttctg	ccaagggtt	gttgcgcatt	4620
tcacagttct	ccgcaagaat	tgattggctc	caattcttgg	agtggtaat	ccgttagcga	4680
ggtgccgc	gttccattc	aggtcgaggt	ggcccgctc	catgcaccgc	gacgcaacgc	4740
ggggaggcag	acaaggtata	gggcggcgcc	tacaatccat	gccaaccgt	tccatgtgct	4800
cggcgaggcg	gcataaatcg	ccgtgacgt	cagcggttca	gtgatcgaag	ttaggctggt	4860
aagagccgcg	agcgatcctt	gaagctgtcc	ctgatggtcg	tcatctacct	gcctggacag	4920
catggcttc	aacgcgggca	tcccgtatgc	gccggaaagcg	agaagaatca	taatgggaa	4980
ggccatccag	cctcgctcg	cgaacgcccag	caagacgtag	cccagcgcgt	cggccgcatt	5040
gccggcgata	atggcctgct	tctcgccgaa	acgtttggtg	gcgggaccag	tgacgaaggc	5100
ttgagcgagg	gcgtgcaaga	ttccgaatac	cgcaagcgac	aggccgatca	tcgtcgct	5160
ccagcgaaag	cggtcctcgc	cgaaaatgac	ccagagcgct	gccggcacct	gtcctacgag	5220
ttgcatgata	aagaagacag	tcataagtgc	ggcgacgata	gtcatcccc	gcccaccc	5280
gaaggagctg	actgggttga	aggctctcaa	ggccatcggt	cgacgctctc	ccttatgcga	5340
ctcctgcatt	aggaagcagc	ccagtagtag	gttgaggccg	ttgagcaccg	ccgcccgaag	5400
gaatggtgca	tgcatacgatc	accacaattc	agcaaattgt	gaacatcatc	acgttcatct	5460
ttccctgggt	gccaatggcc	catttcctg	tcaatgcgt	gaaggatcg	aattcaggcg	5520
cttttttagac	tggtcgtat	gaacaattct	taagaaggag	atatacatat	gtttgacgta	5580
atagttaaga	actgcccgtat	ggtgtccagc	gacggaaatca	ccgaggcaga	cattctggtg	5640
aaagacggca	aagtgcgcgc	aatcagctcg	gacacaagtg	atgttgggc	gagccgaacc	5700
attgacgcgg	gtggcaagtt	cgtgtatgcgc	ggcgtggtcg	atgaacatgt	gcatatcatc	5760
gacatggatc	tgaagaaccg	gtatggccgc	ttcgaactcg	attccgagtc	tgccggccgt	5820
ggaggcatca	ccaccatctt	tgagatgcgc	tttaccttcc	cgcccaccac	cactttggac	5880
gccttcctcg	aaaagaagaa	gcaggcgcccc	cagcggttga	aagtgtactt	cgcgctctat	5940

ggcgggtggag	tgccggaaa	cctgcccag	atccgaaaa	tgcacgacgc	cggcgactg	6000
ggcttcaagt	caatgatggc	agcctcagtt	ccgggcattgt	tcgacgcccgt	cagcgacggc	6060
gaactgttcg	aaatcttcca	ggagatcgca	gcctgtggtt	cagtcgccgt	ggtccatgcc	6120
gagaatgaaa	cgatcattca	agcgctccag	aagcagatca	aagccgctgg	tcgcaaggac	6180
atggccgcct	acgaggcatc	ccaaccagg	ttccaggaga	acgaggccat	tcagcgtgcg	6240
ttactactgc	agaaaagaagc	cggctgtcga	ctgattgtgc	ttcacgtgag	caaccctgac	6300
ggggtcgagc	tgatacatcg	ggcgcaatcc	gagggccagg	acgtccactg	cgagtcgggt	6360
ccgcagtatc	tgaatatcac	cacggacgac	gccgaacgaa	tcggaccgta	tatgaaggtc	6420
gccccgcccc	tccgctcagc	cgagatgaac	gtcagattat	gggaacaact	tgagaacggg	6480
ctcatcgaca	cccttgggtc	agaccacggc	ggacatcctg	tcgaggacaa	agaacccggc	6540
tggaaggacg	tgtggaaagc	cggcaacgg	gcgctggcc	ttgagacatc	cctgcctatg	6600
atgctgacca	acggagtgaa	taaaggcagg	ctatccttgg	aacgcctcgt	cgaggtgatg	6660
tgcgagaaac	ctgcgaagct	ctttggcatc	tatccgcaga	agggcacgct	acaggttgg	6720
tccgacgccc	atctgctcat	cctcgatctg	gatattgaca	ccaaagtgg	tgccctcgac	6780
ttccgatccc	tgcataagta	cagcccggtc	gacgggatgc	ccgtcacggg	tgccacgggt	6840
ctgacgatgg	tgcgcggAAC	ggtgtggca	gagaagggag	aagttctgg	cgagcaggaa	6900
ttcggccagt	tcgtcacccg	tcacgactac	gaggcgtcga	agtgaggatc	tcgacgctct	6960
cccttatg	cgactcctgcat	taggaagcag	cccagtagta	ggttgaggcc	gttgagcacc	7020
ggccggccaa	ggaatggtgc	atgcatcgat	caccacaatt	cagcaaattg	tgaacatcat	7080
cacgttcatc	tttccctgg	tgccaatggc	ccatttcct	gtcagtaacg	agaaggtcgc	7140
gaattcagc	gctttttaga	ctggtcgtaa	tgaac			7175

<210> 15
 <211> 5989
 <212> DNA
 <213> Artificial sequence

<220>
 <223> plasmid containing sequence encoding hydantoin racemase of
 Arthrobacter crystallopioetes

<400> 15	aattcttaag	aaggagat	acatatggat	gcaaagctac	tggttggcgg	cactatttt	60
	tcctcgaccg	gcaaaatccg	agccgacgtg	ctgattgaaa	acggcaaagt	cggcgctgtc	120
	ggcatgctgg	acgcccgcac	gccggacaca	gttgagcggg	ttgactgcga	cggcaaatac	180
	gtcattccccg	gcggtatcga	cgttcacacc	cacatcgact	ccccctcat	ggggaccacc	240

accggccgatg	attttgtcag	cggAACGATT	gcAGCCGCTA	ccGGCGGAAC	aACGACCATC	300
gtcgatttcg	gacAGCAGCT	cgCCGGCAAG	aACCTGCTGG	aatCCGCAGA	cgCGCACCAc	360
aaaaaggcgc	agggaaATC	cgtcattGAT	tacGGCTTCC	atATGTGCGT	gacGAACCTC	420
tatgacaatt	tcgattcccA	tatGGCAGAA	ctgACACAGG	acgGAATCTC	cAGTTCAAG	480
gtcttcatgg	cctaccGCGG	aAGCCTGATG	atcaACGACG	gcGAACGTtT	cgACATCCTC	540
aagggagtCG	gctccAGCGG	tgccAAactA	tgcgtccACG	cAGAGAACGG	cgACGTcATC	600
gacaggatCG	ccGCCGACCT	ctacGCCAA	ggAAAAAACCG	ggCCCgggAC	ccACGAGATC	660
gcacGCCGC	cgGAATCGGA	agTCGAAGCA	gtcAGCCGGG	ccATCAAGAT	ctCCCGGATG	720
gccgaggTGC	cgCTGTATTt	cgtcAtCTtT	tccACCCAGG	gggCCGTCGA	ggaAGTAGCT	780
gccgcgcaga	tgacAGGATG	gccaATCAGC	gccGAAACGT	gcACCCACTA	cctgtcgctG	840
agCCGGGACA	tctacGACCA	gccGGGATTc	gagCCGGCCA	aAGCTGTCT	cACACCACCG	900
ctgCGCACAC	agGAACACCA	ggacGCGTTG	tggAGAGGCA	ttaACACCGG	tgcgtcAGC	960
gtcgtcAGTT	ccgACCACTG	cccCTTCTGC	tttGAGGAAA	agcAGCGGAT	ggggGGCAGAT	1020
gacttCCGGC	agatCCCCAA	cgGCGGGCCC	ggcgtggAGC	accGAATGCT	cgtGATGTAT	1080
gagACCGGTG	tcgCGGAAGG	aaaaATGACG	atcGAGAAAT	tcgtcAGGt	gactGCCGAG	1140
aACCCGGCCA	agcaATTcGA	tatgtACCCG	aaaaAGGGAA	caATTGcACC	gggCTCCGAT	1200
gcAGACATCA	tcgtggTCGA	ccccAACGGA	acaACCCtCA	tcAGTGCcGA	cACCCAAAAA	1260
caAAACATGG	actACACGCT	gttcGAAGGC	ttcaAAATCC	gttGCTCCAT	cgACCAGGtG	1320
ttCTCGCTG	gcGACCTGAT	cAGCGTCAA	ggcGAATATG	tcggCACCCG	cgGCCGCGGC	1380
gaATTcATCA	agcGGAGCGC	ttggAGCCAC	ccgcAGTTG	aaaaATAAAA	gcttggCTGT	1440
tttGGCGGAT	gagAGAGAT	tttcAGCCTG	atacAGATTA	aatcAGAACG	cAGAACGCGT	1500
ctgataAAAC	agaATTGCC	tggCGGCAGT	agcGCGGTGG	tcccACCTGA	ccccATGCCG	1560
aACTCAGAAAG	tGAAACGCCG	tagCGCCGAT	ggtAGTGTGG	ggtCTCCCCA	tgcgAGAGATA	1620
ggGAACtGCC	aggCATCAA	taAAACGAAA	ggctcAGTCG	aaAGACTGGG	cTTTcGTT	1680
tATCTGTtGT	ttgtCGGTGA	acGCTCTCCT	gAGTAGGACA	aatCCGCCGG	gAGCGGATT	1740
gaACGTTGCG	aAGCAACGGC	ccggAGGGTG	gcGGGcAGGA	cgCCCGCCAT	aaACTGCCAG	1800
gcATCAAATT	aAGCAGAAGG	ccATCCTGAC	ggatGGCCTT	tttGCGTTc	tacAAACTCT	1860
tttGTTTATT	tttCTAAATA	cattCAAATA	tgtATCCGCT	catGAGACAA	taACCCtGAT	1920
aaATGCTTCA	ataATATTGA	aaaAGGAAGA	gtATGAGTAT	tcaACATTc	cgtgtcgccc	1980
ttattCCCTT	tttGCGGCA	tttGCTTC	ctgtTTTGC	tcACCCAGAA	acgCTGGTGA	2040
aAGTAAAAGA	tgctGAAGAT	cAGTGGGTG	cACGAGTGGG	ttACATCGAA	ctggatCTCA	2100

acagcggtaa gatcctttag agttttcgcc cogaagaacg tttccaatg atgagcactt	2160
ttaaagtct gctatgtggc gcggatttat cccgtgtga cgccggcaa gagcaactcg	2220
gtcgccgcac acactattct cagaatgact tggtagtgc ctcaccagtc acagaaaagc	2280
atcttacgga tggcatgaca gtaagagaat tatgcagtgc tgccataacc atgagtgata	2340
acactgcggc caacttactt ctgacaacga tcggaggacc gaaggagcta accgctttt	2400
tgcacaacat ggggatcat gtaactcgcc ttgatcggt ggaaccggag ctgaatgaag	2460
ccataccaaa cgacgagcgt gacaccacga tgcctgtac aatggcaaca acgttgcgca	2520
aactattaac tggcgaacta cttactctag cttccggca acaattaata gactggatgg	2580
aggcggataa agttgcagga ccacttctgc gctcgccct tccggctggc tggtttattg	2640
ctgataaaatc tggagccggt gagcgtgggt ctcgcgtat cattgcagca ctggggccag	2700
atggtaagcc ctcccgatc gtagttatct acacgacggg gagtcaggca actatggatg	2760
aacgaaatag acagatcgct gagataggtg cctcaactgat taagcattgg taactgtcag	2820
accaagtttca ctcatatata ctttagattt attaaaaact tcattttaa tttaaaagga	2880
tctaggtgaa gatcctttt gataatctca tgacaaaaat cccttaacgt gagtttcgt	2940
tccactgagc gtcagacccc gtagaaaaaga tcaaaggatc ttcttgagat ctttttttc	3000
tgcgcgtaat ctgctgcttg caaacaaaaa aaccaccgct accagcggtg gtttgttgc	3060
cggatcaaga gctaccaact cttttccga agttaactgg cttcagcaga ggcgcagatac	3120
caaatactgt cttcttagtg tagccgttagt taggccacca cttcaagaac tctgttagcac	3180
cgcctacata cctcgctctg ctaatcctgt taccagtggc tgctgccagt ggccataagt	3240
cgtgtcttac cgggttggac tcaagacgt agttaccgga taaggcgcag cggcgggct	3300
gaacgggggg ttcgtgcaca cagccagct tggagcgaac gacctacacc gaactgagat	3360
acctacagcg tgagctatga gaaagcgcca cgcttcccgaa agggagaaag gcggacaggt	3420
atccggtaag cggcagggtc ggaacaggag agcgcacgag ggagcttcca gggggaaacg	3480
cctggtatct ttatagtcct gtcgggttgc gccacctctg acttgagcgt cgattttgt	3540
gatgctcgac agggggcgcc agcctatggaa aaaacgcccag caacgcggcc ttttacggt	3600
tcctggcctt ttgctggcct tttgctcaca tggctttcc tgcgttatcc cctgattctg	3660
tggataaccg tattaccgccc tttgagtgag ctgataccgc tgcggcagc cgaacgaccg	3720
agcgcagcga gtcagtgagc gaggaagcgg aagagcgcct gatgcgtat tttctcctta	3780
cgcacatctgt cggattttca caccgcataat atggtgact ctcagttacaa tctgctctga	3840
tgccgcatacg ttaagccagt atacactccg ctatcgctac gtgactgggt catggctgca	3900
ccccgacacc cgccaaacacc cgctgacgca ccctgacggg cttgtctgct cccggcatcc	3960

gcttacagac aagctgtgac cgtctccggg agctgcatgt gtcagaggtt ttcaccgtca	4020
tcaccgaaac gcgcgaggca gctgcggtaa agctcatcag cgtggtcgtg aagcgattca	4080
cagatgtctg cctgttcatc cgcgtccagc tcgttgagtt tctccagaag cgtaatgtc	4140
tggcttctga taaagcgggc catgttaagg gcggttttt cctgtttggt cacttgatgc	4200
ctccgtgtaa ggggaattt ctgttcatgg gggtaatgtat accgatgaaa cgagagagga	4260
tgctcacat acgggttact gatgtatgaaat atgcccggtt actgaaacgt tgtgagggt	4320
aacaactggc ggtatggatg cggcgggacc agagaaaaat cactcagggt caatgccagc	4380
gcttcgttaa tacagatgta ggtgttccac aggtagcca gcagcatcct gcgtatgcaga	4440
tccggaacat aatggtgcag ggctgtact tccgcgttcc cagactttac gaaacacgg	4500
aaccgaagac cattcatgta gttgctcagg tcgcagacgt tttgcagcag cagtcgcttc	4560
acgttcgctc gcgtatcggt gattcattct gctaaccagt aaggcaaccc cgccagccta	4620
gccgggtcct caacgacagg agcagcatca tgccgcaccccg tggccaggac ccaacgctgc	4680
ccgagatgcg ccgcgtgcgg ctgctggaga tggcggacgc gatggatatg ttctgccaag	4740
ggttggtttg cgcattcaca gttctccgca agaattgatt ggctccaatt cttggagtgg	4800
tgaatccgtt agcgaggtgc cgccggcttc cattcagggtc gaggtggccc ggctccatgc	4860
accgcgcacgc aacgcgggaa ggcagacaag gtatagggcg ggcctacaa tccatgcca	4920
cccggttccat gtgctcgccg aggccgcata aatcgccgtg acgatcagcg gtccagtgt	4980
cgaagttagg ctggtaagag ccgcgagcga tccttgaagc tgtccctgat ggctgtcatc	5040
tacctgcctg gacagcatgg cctgcaacgc gggcatcccg atgcccgg aagcgagaag	5100
aatcataatg gggaaaggcca tccagcctcg cgtcgcgaac gccagcaaga cgtagcccag	5160
cgcgtcgccc gccatgccgg cgataatggc ctgcttctcg ccgaaacgtt tggggcggg	5220
accagtgacg aaggcttgag cgagggcgtg caagattccg aataccgcaa ggcacaggcc	5280
gatcatcgac gcgcgtccagc gaaagcggtc ctcggccaaa atgaccaga ggcgtcgccc	5340
cacctgtcct acgagttgca tgataaaagaa gacagtcata agtgcggcga cgatagtcat	5400
cccccgcccc cacccgaagg agctgactgg gttgaaggct ctcaagggca tcggtcgacg	5460
ctctccctta tgctgactcct gcatttagaa gcagccagt agtaggttga ggccgtttag	5520
caccggccccc gcaaggaatg gtgcgtgc gatggctacg agggcagaca gtaagtggat	5580
ttaccataat cccttaattt tacgcaccgc taaaacgcgt tcagcgcgt cacggcagca	5640
gacaggtaaa aatggcaaca aaccacccta aaaactgcgc gatcgcgcct gataaaattt	5700
aaccgtatga atacctatgc aaccagaggg tacaggccac attacccca cttaatccac	5760
tgaagctgcc attttcatg gtttaccat cccagcgaag ggccatgcgt gcatcgaaat	5820

taatacgaacg aaattaatac gactcactat agggcaattt cgatcaccac aattcagcaa	5880
attgtgaaca tcatcacgtt catcttccc tggttgccaa tggcccattt tcctgtcagt	5940
aacgagaagg tcgcgaattt aggcgcttt tagactggtc gtaatgaac	5989

<210> 16
<211> 6958
<212> DNA
<213> Artificial sequence

<220>
<223> plasmid containing sequence encoding hydantoin racemase of Arthrobacter crystallopioetes

<400> 16	
aattcttaag aaggagatat acatatggcg aaaaacttga tgctcggtt cgctcaagtc	60
ggcggtatcg atagttcgga atcaagaccc gaagtcgtcg cccgcttgat tgccctgctg	120
gaagaagcag cttcccaggg cgccgaactg gtggtcttc ccgaactcac gctgaccacg	180
ttcttccgc gtacctggtt cgaagaaggc gacttcgagg aataacttgc aataatccatg	240
cccaatgacg acgtcgcc cctttcgaa cgcccaaag accttggcgt gggcttctac	300
ctcgatagc cggaactgac cagtgtatgag aagcggtaca acacatcaat tctggtaac	360
aagcacggcg acatcgccgg caagtaccgc aagatgcatt tgccgggcca cgccgataac	420
cgggaaggac tacccaacca gcaccttgaa aagaaataact tccgcaagg agatctcgga	480
ttcggtgtct tcgacttcca cggcgtcag gtcggaatgt gtctctgcaa cgaccggcga	540
tggccggagg tctaccgctc tttggccctg cagggagcag agctcggtt cctgggctac	600
aacacccccc atttcgttcc cggctggcag gaagagcctc acgcgaagat gttcacgcac	660
cttcttcac ttcaaggcagg ggcataccag aactcggtat ttgtggcggc tgccggcaag	720
tcgggcttcg aagacgggca ccacatgatc ggcggatcag cggcgccgc gcccagggc	780
gaaatcctgg caaaagcagc cggcgaggc gatgaagtcg tcgttgtgaa agcagacatc	840
gacatggcga agccctataa ggaaagcgtc ttcaacttcg ccgcctatcg ggcggccgac	900
gcatacggca tcatcgccga aaggaaaggc cggggcgccc cactgcccgt cccgttcaac	960
gtgaatgact aaggatccga aggagatata catatggatg caaagctact gttggcggc	1020
actattgttt cctcgaccgg caaaatccga gccgacgtgc tgattaaaa cggcaaagtc	1080
gccgctgtcg gcatgctgga cgccgcgacg cggacacag ttgagcgggt tgactgcgac	1140
ggcaaatacg tcatgccccgg cggtatcgac gttcacaccc acatcgactc cccctcatg	1200
gggaccacca cggccgatga ttttgtcagc ggaacgattt cagccgtac cggcggaaaca	1260
acgaccatcg tcgatttcgg acagcagctc gccggcaaga acctgctgga atccgcagac	1320

gcgaccacaca	aaaaggcgca	ggggaaatcc	gtcattgatt	acggcttcca	tatgtgcgtg	1380
acgaacctct	atgacaattt	cgattcccat	atggcagaac	tgacacagga	cggaatctcc	1440
agtttcaagg	tcttcatggc	ctaccgcgga	agcctgatga	tcaacgacgg	cgaactgttc	1500
gacatcctca	agggagtcgg	ctccagcggt	gccaaactat	gcgtccacgc	agagaacggc	1560
gacgtcatcg	acaggatcgc	cgccgacctc	tacgcccagg	aaaaaacccgg	gccccgggacc	1620
cacgagatcg	cacgcccggcc	ggaatcgaa	gtcgaagcag	tcagccgggc	catcaagatc	1680
tcccggatgg	ccgaggtgcc	gctgtatttc	gtgcatttt	ccaccagggg	ggccgtcgag	1740
gaagtagctg	ccgcgcagat	gacaggatgg	ccaatcagcg	ccgaaacgtg	cacccactac	1800
ctgtcgctga	gccgggacat	ctacgaccag	ccgggattcg	agccggccaa	agctgtcctc	1860
acaccaccgc	tgcgcacaca	ggaacaccag	gacgcgttgt	ggagaggcat	taacaccggt	1920
gcgctcagcg	tcgtcagttc	cgaccactgc	cccttctgct	ttgagaaaaa	gcagcggatg	1980
ggggcagatg	acttccggca	gatccccaaac	ggcgggccccg	gcgtggagca	ccgaatgctc	2040
gtgatgtatg	agaccggtgt	cgcggaaagga	aaaatgacga	tcgagaaatt	cgtcgaggtg	2100
actgccgaga	accgggccaa	gcaattcgat	atgtacccga	aaaagggAAC	aattgcacccg	2160
ggctccgatg	cagacatcat	cgtggtcgac	cccaacggaa	caaccctcat	cagtgccgac	2220
acccaaaaac	aaaacatgga	ctacacgctg	ttcgaaggct	tcaaaatccg	ttgctccatc	2280
gaccaggtgt	tctcgctgg	cgacctgatc	agcgtcaaag	gcgaatatgt	cggcacccgc	2340
ggccgcggcg	aattcatcaa	gcggagcgct	tggagccacc	cgcagttcga	aaaataaaag	2400
cttggctgtt	ttggcggatg	agagaagatt	ttcagcctga	tacagattaa	atcagaacgc	2460
agaagcggtc	tgataaaaca	gaatttgct	ggcggcagta	gcgcggtggt	cccacctgac	2520
cccatgcgga	actcagaagt	gaaacgcgt	agcgcgcgatg	gtagtgtggg	gtctcccat	2580
gcgagagtag	ggaactgcca	ggcatcaa	aaaacgaaag	gctcagtcga	aagactggc	2640
ctttcggttt	atctgttgtt	tgtcggtgaa	cgctctcctg	agtaggacaa	atccgcgggg	2700
agcggatttg	aacgttgcga	agcaacggcc	cggagggtgg	cggcaggac	gcccggccata	2760
aactgccagg	catcaaatta	agcagaaggc	catcctgacg	gatggcttt	ttgcgtttct	2820
acaaaactctt	ttgtttat	ttctaaatac	attcaaata	gtatccgctc	atgagacaat	2880
aaccctgata	aatgcttcaa	taatattgaa	aaaggaagag	tatgagtatt	caacatttcc	2940
gtgtcgccct	tattccctt	tttgcggcat	tttgccttcc	tgttttgct	cacccagaaa	3000
cgctggtgaa	agtaaaagat	gctgaagatc	agttgggtgc	acgagtgggt	tacatcgaac	3060
tggatctcaa	cagcggtaag	atccttgaga	gtttcgccc	cgaagaacgt	tttccaatga	3120
tgagcacttt	taaagttctg	ctatgtggcg	cgttattatc	ccgtgttgac	gccgggcaag	3180

agcaactcg	tcgcccata cactattctc agaatgactt gggtgagtac tcaccagtca	3240
cagaaaagca	tcttacggat ggcacatgacag taagagaatt atgcagtgtc gccataacca	3300
tgagtgataa	cactgcggcc aacttacttc tgacaacgtat cgaggagaccg aaggagctaa	3360
ccgctttttt	gcacaacatg ggggatcatg taactcgctt tgatcggtgg gaaccggagc	3420
tgaatgaagc	cataccaaac gacgagcgtg acaccacgtat gcctgttagca atggcaacaa	3480
cgttgcgcaa	actattaact ggcgaactac ttactctagc ttcccgccaa caattaatag	3540
actggatgga	ggcgataaa gttgcaggac cacttctgctt ctcggccctt ccggctggct	3600
ggtttattgc	tgataaatct ggagccggtg agcgtgggtc tcgcggtac attgcagcac	3660
tggggccaga	tggtaagccc tcccgtatcg tagttatcta cacgacgggg agtcaggcaa	3720
ctatggatga	acgaaataga cagatcgctg agatagggtgc ctcactgatt aagcatttgt	3780
aactgtcaga	ccaagtttac tcataatatac ttttagattga tttaaaactt catttttaat	3840
ttaaaaggat	ctaggtgaag atcccttttataatctcat gaccaaaatc ccttaacgtg	3900
agtttcgtt	ccactgagcg tcagaccccg tagaaaagat caaaggatct tcttgagatc	3960
cttttttct	gcgcgtaatc tgctgcttgc aaacaaaaaa accaccgcta ccagcggtgg	4020
tttggggcc	ggatcaagag ctaccaactc ttttccgaa ggttaactggc ttcagcagag	4080
cgcagataacc	aaatactgtc cttctagtgt agccgtagtt aggccaccac ttcaagaact	4140
ctgttagcacc	gcctacatac ctcgctctgc taatcctgtt accagtggct gctgccagt	4200
gcgataagtc	gtgtcttacc ggggtggact caagacgata gttaccggat aaggcgcagc	4260
ggtcgggctg	aacgggggt tcgtgcacac agcccgctt ggagcgaacg acctacaccg	4320
aactgagata	cctacagcgt gagctatgag aaagcgccac gttccgaa gggagaaagg	4380
cgacaggta	tccgtaagc ggcagggtcg gaacaggaga ggcacgagg gagcttccag	4440
ggggaaacgc	ctggtatctt tatagtctgc tcgggtttcg ccacctctga cttgagcgtc	4500
gattttgtg	atgctcgta gggggggcga gcctatggaa aaacgccagc aacgcggcct	4560
tttacggtt	cctggcctt tgctggcctt ttgctcacat gttcttcct gcgttatccc	4620
ctgattctgt	ggataaccgt attaccgcct ttgagtgagc tgataccgt cggcccgagcc	4680
gaacgaccga	gcccgcgcgag tcagtgagcg aggaagcggaa agagcgcctg atgcggatt	4740
ttctccttac	gcacatctgtgc ggtatttcac accgcataatac tggtgcactc tcagtacaat	4800
ctgctctgtat	gccgcatagt taagccagta tacactccgc tatcgctacg tgactgggtc	4860
atggctgcgc	ccccacacccc gccaacacccc gctgacgcgc cctgacgggc ttgtctgctc	4920
ccggcatccg	cttacagaca agctgtgacc gtctccggga gctgcattgtc tcagaggtt	4980
tcaccgtcat	caccgaaacg cgcgaggcag ctgcggtaaa gctcatcagc gtggctgtca	5040

agcgattcac agatgtctgc ctgttcatcc gcgtccagct cgttgagttt ctccagaagc	5100
gttaatgtct ggcttctgat aaagcgggcc atgttaaggg cggtttttc ctgttggtc	5160
acttgatgcc tccgtgtaag gggaaatttc tgttcatggg ggtaatgata ccgatgaaac	5220
gagagaggat gctcacgata cgggttactg atgatgaaca tgcccggta ctggaacgtt	5280
gtgagggtaa acaactggcg gtatggatgc ggcgggacca gagaaaaatc actcagggtc	5340
aatgccagcg cttcgttaat acagatgtag gtgttccaca gggtagccag cagcatcctg	5400
cgtatgcagat ccggaacata atgggcagg ggcgtgactt ccgcgttcc agactttacg	5460
aaacacggaa accgaagacc attcatgttgc ttgctcaggt cgcagacgtt ttgcagcagc	5520
agtcgcttca cgttcgctcg cgtatcggtg attcattctg ctaaccagta aggcaacccc	5580
gccagcctag ccgggtcctc aacgacagga gcacgatcat gcgcacccgt gccaggacc	5640
caacgctgcc cgagatgcgc cgcgtgcggc tgctggagat ggcggacgcg atggatatgt	5700
tctgccaagg gttggttgc gcattcacag ttctccgcaa gaattgattt gctccaattt	5760
ttggagtggtaaatccgttgc gcgaggtgcc gccggcttcc attcaggtcg aggtggcccg	5820
gctccatgca ccgcgacgca acgcggggag gcagacaagg tatagggcgg cgcctacaat	5880
ccatgccaac ccgttccatg tgctcgccga ggcggcataa atcgccgtga cgatcagcgg	5940
tccagtgatc gaagtttaggc tggtaagagc cgcgagcgat cttgaagct gtccctgatg	6000
gtcgtcatct acctgcctgg acagcatggc ctgcaacgcg ggcattccga tgccgcccga	6060
agcgagaaga atcataatgg ggaaggccat ccagcctcgc gtcgcgaacg ccagcaagac	6120
gtagccccagc gcgtcggccg ccatgcccggc gataatggcc tgcttctcg cggaaacgttt	6180
ggtggcggga ccagtgacga aggcttgagc gagggcgtgc aagattccga ataccgcaag	6240
cgacaggccg atcatcgatcg cgctccagcg aaagcggtcc tcgcccggaaa tgaccaggag	6300
cgctgccggc acctgtccta cgagttgcat gataaagaag acagtcataa gtgcggcgac	6360
gatagtcatg ccccgcccc accggaagga gctgactggg ttgaaggctc tcaaggccat	6420
cggtcgacgc tctcccttat gcgactcctg cattaggaag cagccagta gtaggtttag	6480
gccgttgagc accggccggc caaggaatgg tgcatgctcg atggctacga gggcagacag	6540
taagtggatt taccataatc ccttaattgt acgcaccgct aaaacgcgtt cagcgcatc	6600
acggcagcag acaggtaaaaa atggcaacaa accaccctaa aaactgcgcg atcgccctg	6660
ataaaatttta accgtatgaa tacctatgca accagagggt acaggccaca ttaccccac	6720
ttaatccact gaagctgcca ttttcatgg tttcaccatc ccagcgaagg gccatgcatt	6780
catcgaaatt aatacgacga aattaatacg actcactata gggcaattgc gatcaccaca	6840
attcagcaa ttgtgaacat catcacgttc atctttccct ggttgcataat ggcccatattt	6900

cctgtcagta acgagaaggt cgcgaaattca ggcgctttt agactggtcg taatgaac 6958